Advanced Monitoring Initiative:

Arctic Coastal Data Mining and Assessment Project

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AMI Participants

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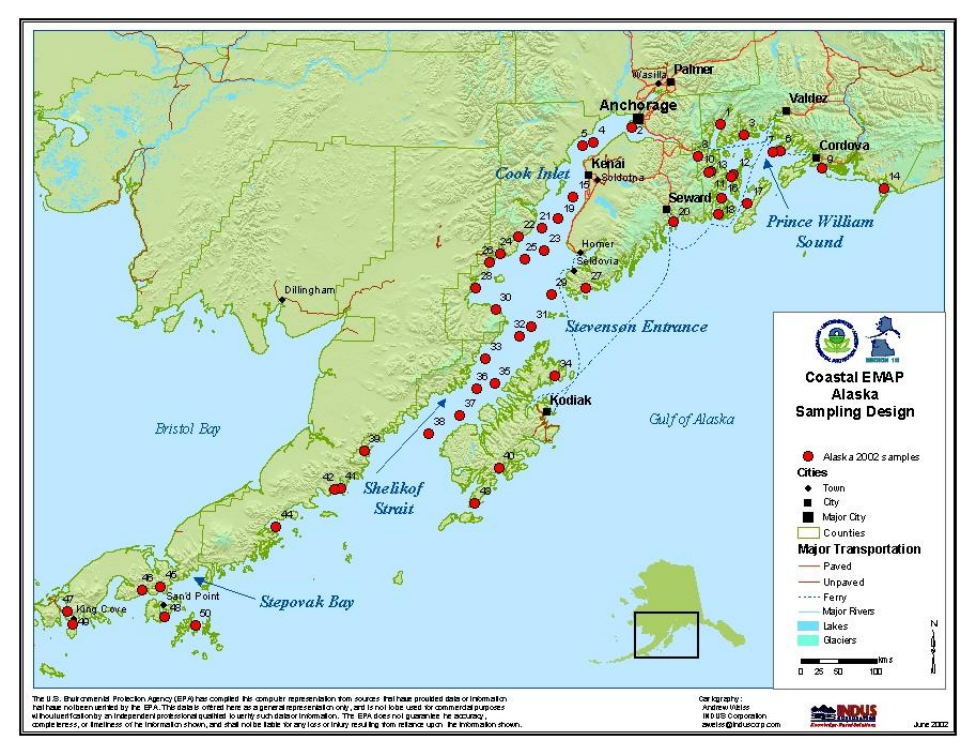
- *ADEC*: Doug Dasher
- *EPA, Region 10*: Dixon Landers, Gretchen Hayslip
- *EPA ORD/National Health and Environmental Effects Research Laboratory (NHEERL)*: Tony Olsen

Background

- Assessment of AK's coastline began in 2002
  - AK Monitoring and Assessment Program (AKMAP)
- Large coastline
  - Broken into regions
  - Sample separately



http://yosemite.epa.gov/r10/OEA.NSF/Monitoring/Coastal+Study+Areas/$FILE/alaska_02.jpg

- **Can we "jump-start" long-term monitoring by examining historical data?**

Methods of AMI

- Assess the usability of historic long-term data for conducting *post hoc* AKMAP assessments
- Use GIS to develop a sampling grid that reflects the spatial density of resource characteristics
  - Sample GIS grid using EPA EMAP random survey method to achieve spatially balanced design
  - Summarize results using descriptive measures

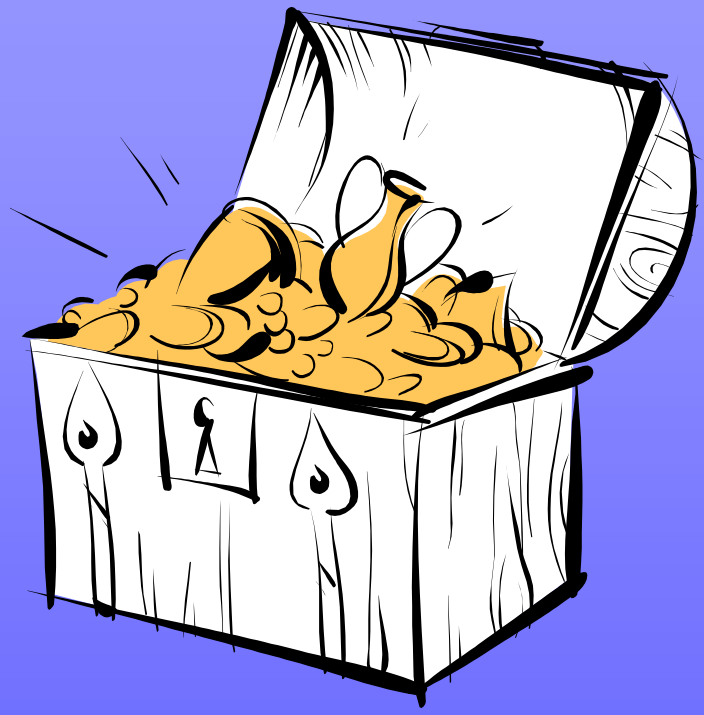
AMI Process and QAPP

- Acquire ANY datasets by searching reports and publications
  - Enter into electronic spreadsheet
  - Reference and standardize the datasets
- Data validity: must be backed by rigorous and documented QA/QC efforts
- Data usability: Is the dataset indicative of overall status or suggest potential trends in temporal or spatial data?

Georeferenced by documented latitudes and longitude

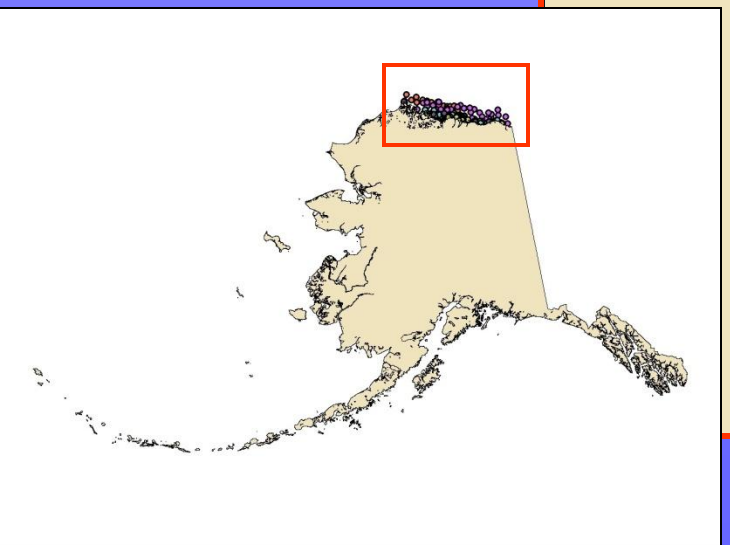
Results of our data-mining

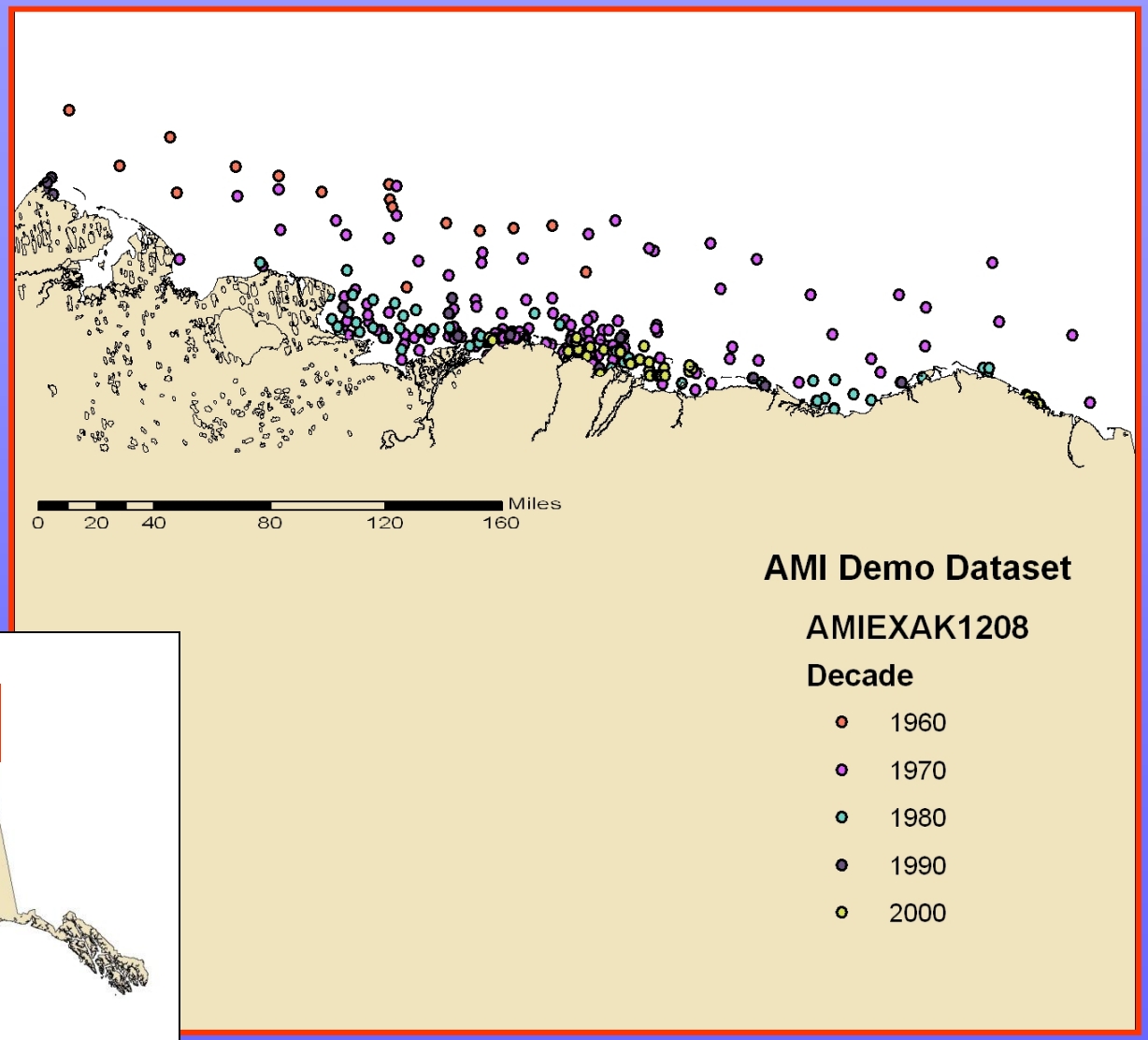
- ~20 reports
- >112 unique stations over 5 decades.
- ~78 physical variables (sediment)
  - Heavy metals
  - Hydrocarbons
  - Grain size



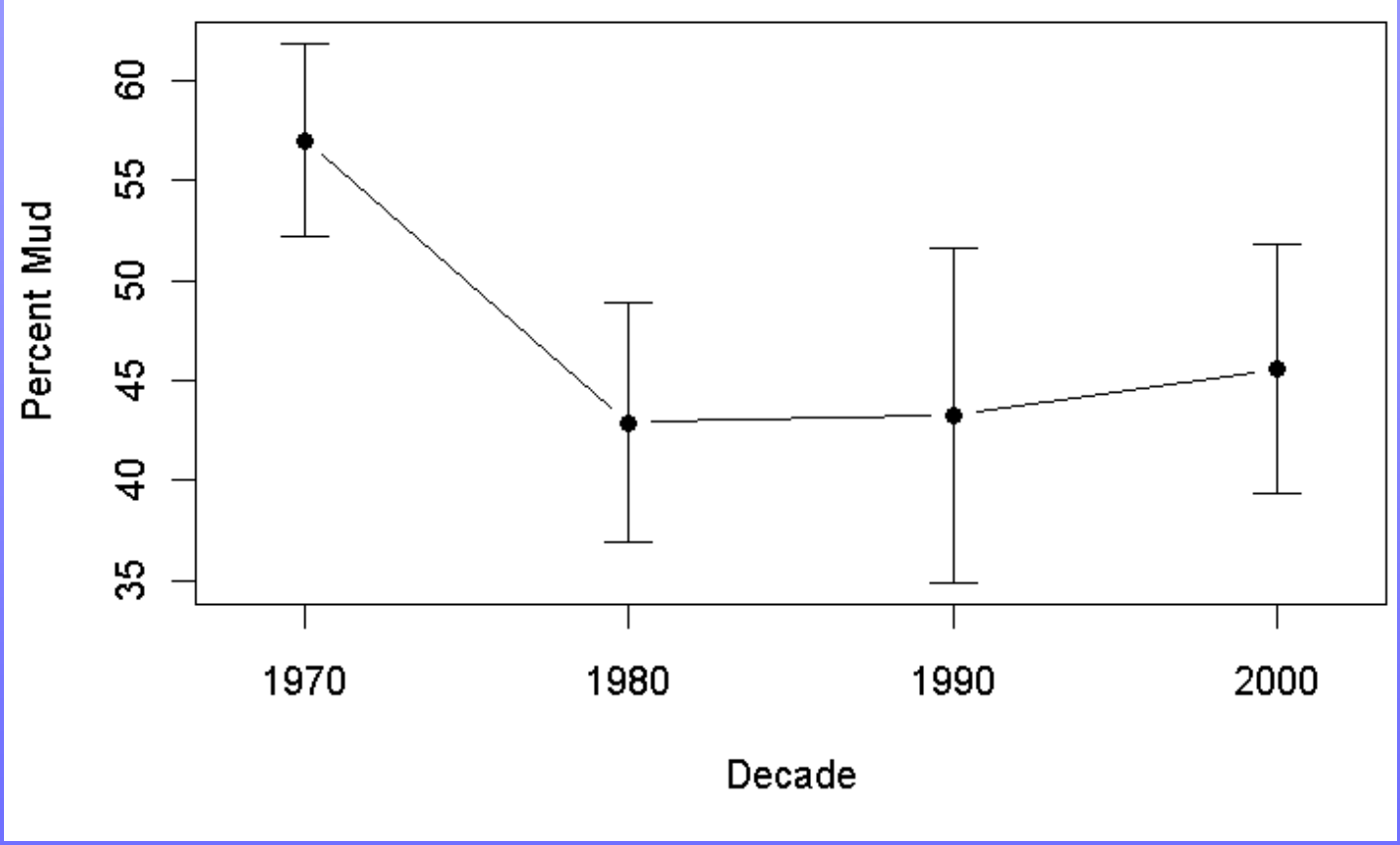
3 trace metals used in AKMAP and percent mud available for 1970's to 2000's and analyzed.

Stations

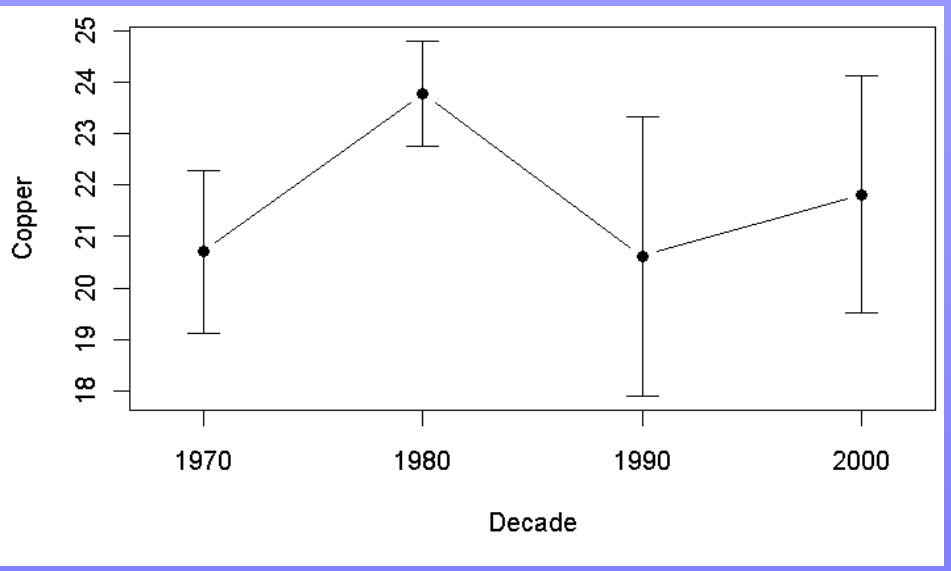


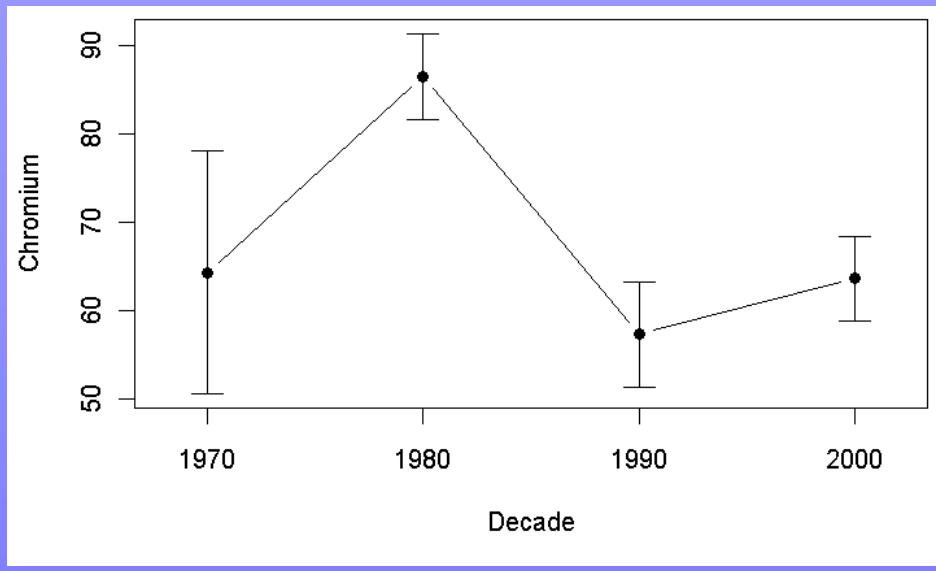

Miles
0 20 40 80 120 160
AMI Demo Dataset
AMIEXAK1208
Decade
1960
1970
1980
1990
2000

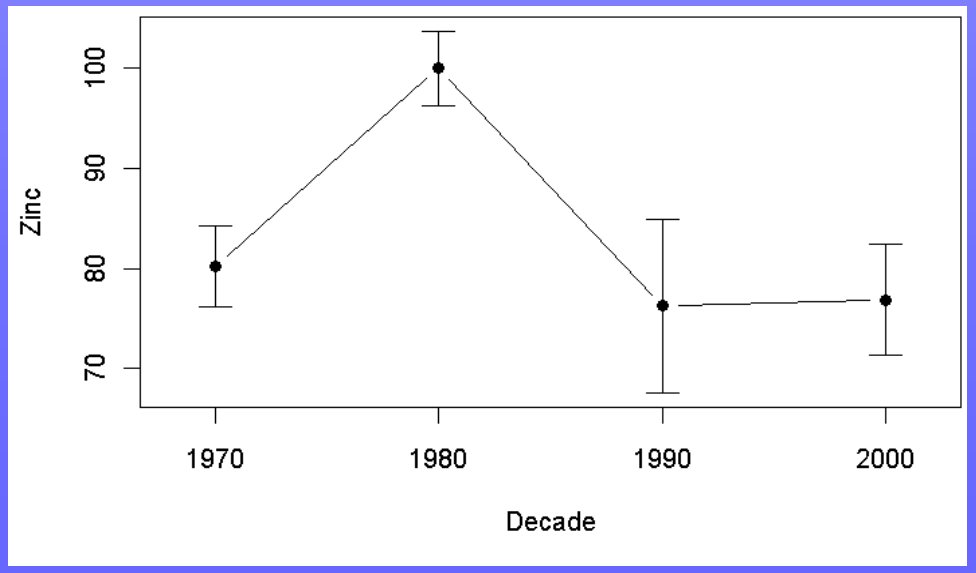
Temporal Trends Percent Mud



Temporal Trends Trace Metals

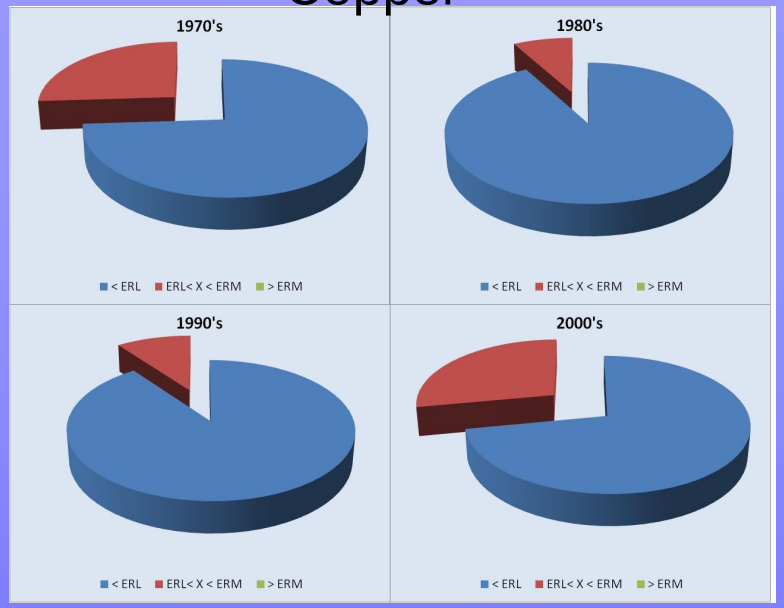




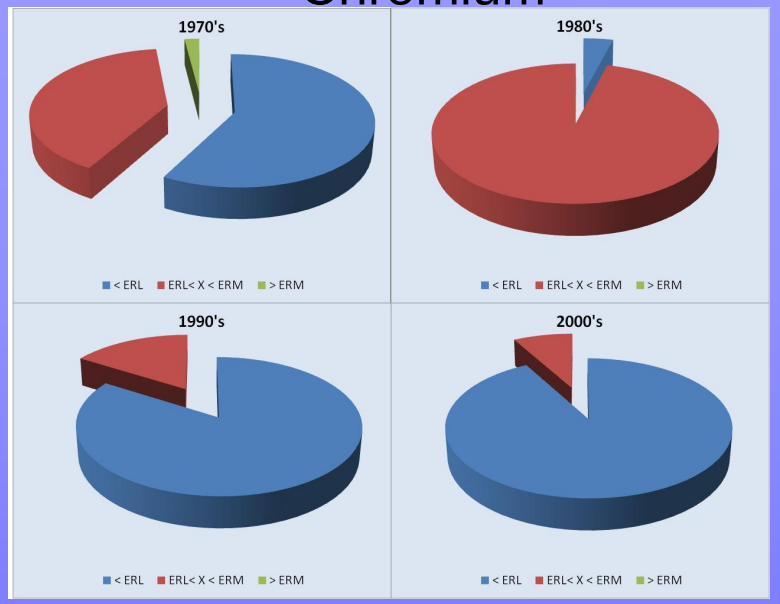


Trace Metals

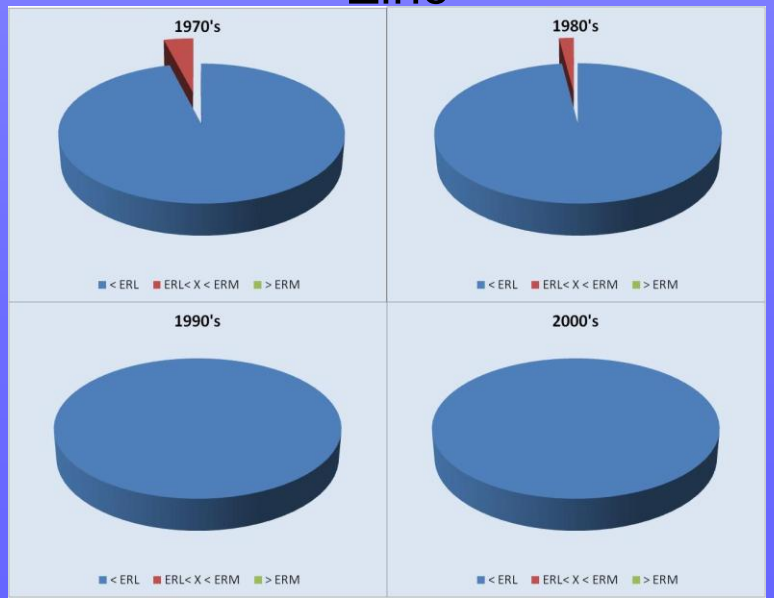
Copper



Chromium



Zinc



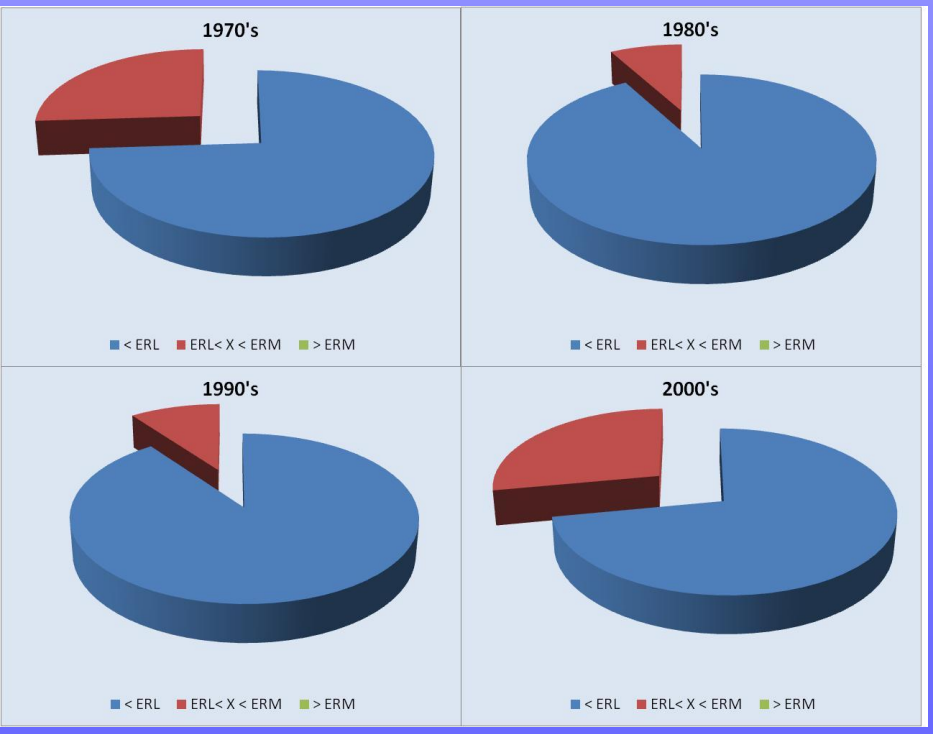
Advanced Methods

- There were not enough data points to apply an EMAP-style analysis using spatially-balanced random sampling.
- Instead, we
  - Simulated data using an advanced statistical technique (geostatistics) and
  - Resampled the simulated data using a spatially-balanced approach.

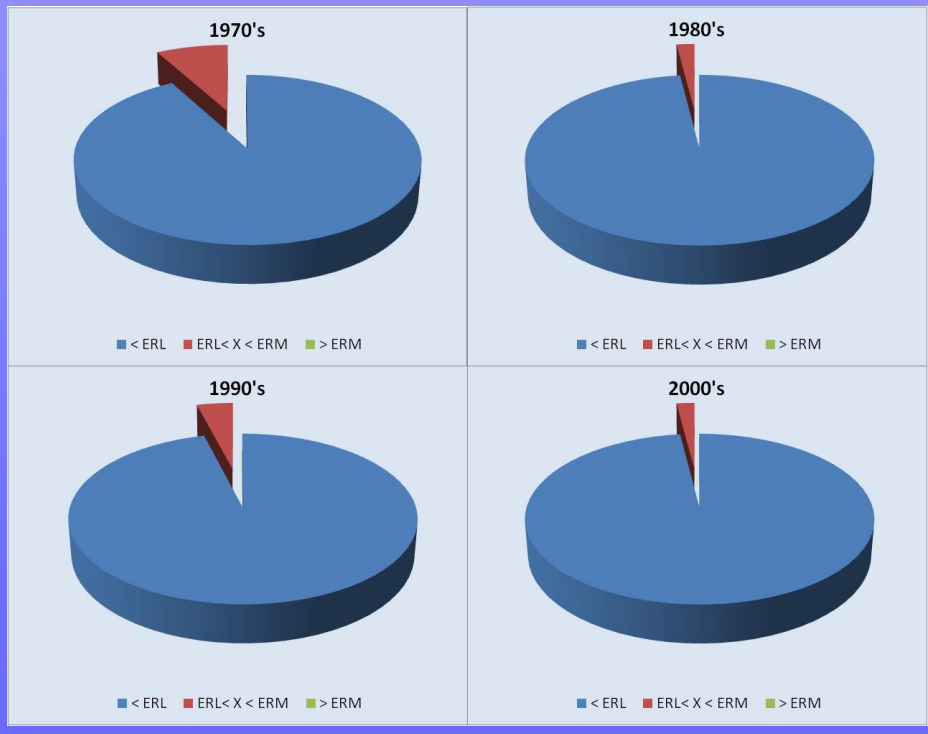
Simulation of EMAP Method

Copper

Original Data



Simulated Data

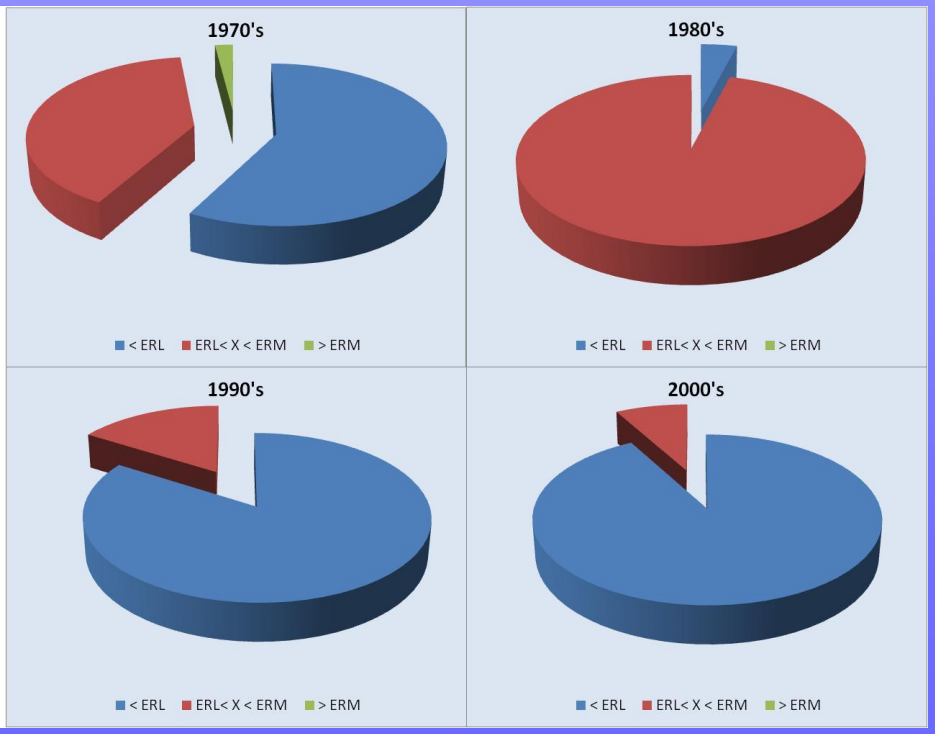


Application of EMAP sampling methods to simulated data within ballpark but underestimates higher values.

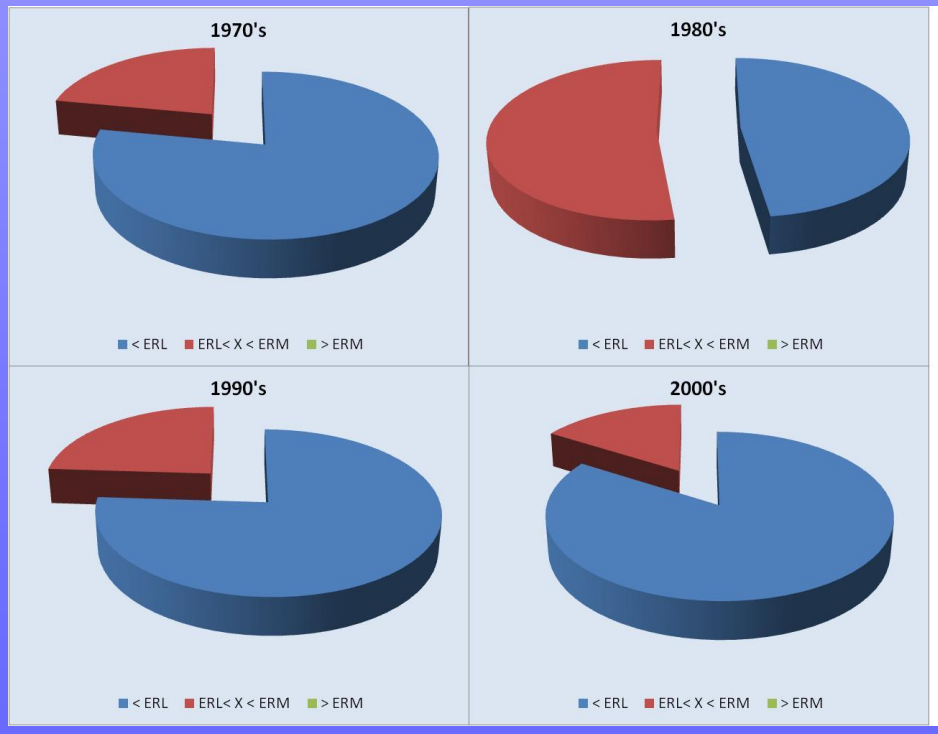
Simulation of EMAP Method

Chromium

Original Data



Simulated Data



Again, application of EMAP sampling methods to simulated data within ballpark but underestimates higher values. For Chromium, method is good for 1990 and 2000.

Conclusions

- We can apply the method to other coastal regions
- Gain insights of status on temporal & regional scales from historic data
- The method can assist with designing future sampling efforts using a spatially-balanced design.

Acknowledgments

- Funded through EPA Office of Research & Development to ADEC and UAF

- References:

  - Long, E.R., MacDonald, D.D., Smith, S.L., and Calder, F.D., 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environmental Management, 19(1): 81-97.